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Web-Based Tutorials: Does Course Use Differ From General Use?

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Ohio State University Libraries' *net.TUTOR* program provides Web-based instruction on various aspects of using the Internet for research. Data extracted from 465 user history logs was analyzed to determine patterns of usage of the *net.TUTOR* tutorials by course-affiliated and general users during the 1997-1998 academic year. The tutorials include lessons, quizzes, and supplementary features. General users were more likely to view only the lesson portions of the tutorials, skipping quizzes. Course-affiliated users, who were required to submit quiz scores, skipped the lessons preceding those quizzes almost 40% of the time. Changing the method of quiz scoring encouraged more students to view lessons before taking quizzes. Fifteen percent of both groups used all available portions of tutorials. General users also spent almost twice as much time as students on tutorials. Of course-affiliated users, students in upper division courses spent more time than those in lower division courses on almost all lessons in the program.

The Internet, particularly the World Wide Web (WWW), has taken a firm hold as a medium for learning on college campuses throughout the United States. Large universities have found that by offering classes over the Internet, they can build enrollment, particularly in the area of nontraditional students, without increasing classroom space or equipment. Arizona State University, for example, now has 280 classes being conducted on the Internet, with more than 90 using online tests (Khoury, 1998). The TeleCampus Online Course Database (available at http://database.telecampus.com) lists more than 7,000 courses available for delivery over the Internet.

Web-based learning is also popular with students, who like the convenience and flexibility in scheduling their time, but low levels of computer literacy and/or Internet literacy among incoming college students can inhibit their ability to fully participate in these course offerings. While some students have had the opportunity to use these technologies in high school or at home, the disparity in access between "have" and "have not" school districts has been well publicized.

In an effort to boost the Internet literacy level of students, The Ohio State University Libraries, with support from an Academic Enrichment Grant from the University, deployed *net.TUTOR*, a Web-based instructional program in fall quarter 1997. Presently *net.TUTOR* (available at http://gateway.lib.oluo-state.edu/tutor) provides instruction on various aspects of using the Internet for research. The program includes tutorials on using the Web browser, email, mailing lists and newsgroups, searching concepts and techniques, Web search tools and strategies, general research strategies, evaluation of Web sites, intellectual property issues, and methods for citing Internet sources.

Each tutorial includes a "classroom" portion containing between 12 and 20 instructional screens. Content is presented in a succinct manner, along with illustrations where relevant and linked screen shots which users may choose to view. Practice opportunities are provided throughout but are not mandatory. Classroom lessons are followed by multiple-choice quizzes, which are also optional. Additional or extra content includes a list of links to sites that offer

further information and in many cases a "Quick Guide" or "Checklist" which presents lesson information in a concise fashion, optimized for printing.

During the 1997-1998 academic year, 2,581 users completed 5,471 *net.TUTOR* tutorials. Twenty courses required or encouraged use of the program. These ranged from the freshman seminar course, UVC 100, which is an introduction to campus life and study skills, to a variety of research and writing classes in history, education, health sciences, horticulture, and law. Students in Communication 140, "Living in the Information Age," which introduces Internet communication skills in a cultural and social context, heavily utilized the program. Additional information about program usage is provided in the *net.TUTOR Annual Report, 1997-1998* (available at http:// gateway.lib.ohio-state.edu/tutor/reports/ann97-98.html).

The *net.TUTOR* program utilizes *IBTauthor* (now known as *Docent*) course management software and currently runs on a Windows NT server. This software handles user registration and authorization, serves content pages, manages quizzing, records quiz and other user history data, and provides reports on usage. While these reports offer some general insights into how the program is being used, they only provide counts of users who have attempted or completed various tutorials and quizzes.

More detailed information is available in user history logs, including the types of content pages accessed and the time spent on each page. Analysis of these log files provides a means of observing how students are actually utilizing the tutorials. Other studies of student usage of web-based learning resources by Ward (1998), Morss (1998), and Ciba (1998) rely on self-reports by students. An earlier study by Newmarch (1997) utilized web server logs in an attempt to determine page use by students. This article reports data from studies of user history logs maintained by the *IBTauthor* courseware. It focuses in particular on similarities and differences between users fulfilling course requirements and those using the program independently.

Methodology

Four log file studies were completed. A total of 465 detailed user histories were examined. Time spent and tutorial components used were tracked for each lesson viewed by the user. Results were compiled in Microsoft Access databases, which allows the creation of queries and data manipulation.

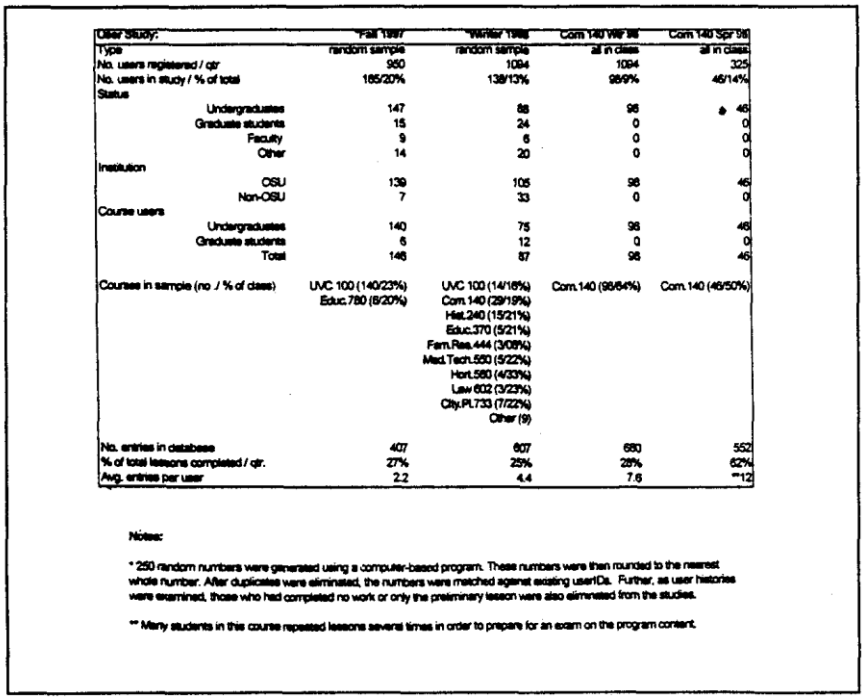
Two of the studies utilized random samples of all registered users for that academic quarter. The first looked at data from fall quarter 1997. A second random sample was drawn from users registering during winter quarter 1998. Both of these samples included a variety of user types (undergraduates, graduate students, faculty, others), although undergraduates predominated in each. In the fall 1997 random sample course-affiliated users were mostly from UVC 100, the required freshman seminar class.

In the winter 1998 random sample, course-affiliated users represent a broader spectrum of courses, including three lower division (100 or 200 level) classes and six upper division or graduate classes (with course numbers from 300 and above). This sample also included a higher percentage of users not affiliated with The Ohio State University. The nature of these data groups permits comparison of the behavior of course-affiliated users with others who were presumably more intrinsically motivated by the desire to learn.

Two other user studies were also completed, but these focused exclusively on Communication 140 students during winter and spring quarters in 1998. In each case, all students who utilized the program were studied. This course is quite popular and focuses on use of the

Internet, with *net.TUTOR* lessons offered as a supplement to labs and other instruction. Although their use of the program was optional, the instructor strongly encouraged it. Because Communication 140 students had such a strong incentive to use *net.TUTOR* and tutorial program content was closely related to course content, comparison of their behavior to students from other courses is of particular interest.

Each data group represents between 9 and 20% of all registered users during that quarter and offers a somewhat different slice or view of user activity. Figure 1 provides detailed information about the composition of each group and how random samples were identified.



User Study:	*Fall 1997	*Winter 1998	Com 140 Win 98	Com 140 Spr 98
Type	random sample	random sample	all in class	all in class
No. users registered / qtr	950	1094	1094	325
No. users in study / % of total	185/20%	138/13%	98/9%	46/14%
Status				
Undergraduates	147	88	98	46
Graduate students	15	24	0	0
Faculty	9	6	0	0
Other	14	20	0	0
Institution				
OSU	139	105	98	46
Non-OSU	7	33	0	0
Course users				
Undergraduates	140	75	98	46
Graduate students	6	12	0	0
Total	146	87	98	46
Courses in sample (no. / % of class)	UVC 100 (140/23%) Educ.780 (6/20%)	UVC 100 (14/16%) Com.140 (29/19%) Hist.240 (15/21%) Educ.370 (5/21%) Fam.Res.444 (3/08%) Med.Tech.550 (5/22%) Hort.580 (4/33%) Law 602 (3/23%) City.Pl.733 (7/22%) Other (9)	Com.140 (98/64%)	Com.140 (46/50%)
No. entries in database	407	607	680	552
% of total lessons completed / qtr.	27%	25%	28%	62%
Avg. entries per user	2.2	4.4	7.6	**12

Notes:

* 250 random numbers were generated using a computer-based program. These numbers were then rounded to the nearest whole number. After duplicates were eliminated, the numbers were matched against existing userIDs. Further, as user histories were examined, those who had completed no work or only the preliminary lesson were also eliminated from the studies.

** Many students in this course repeated lessons several times in order to prepare for an exam on the program content.

Figure 1. Composition of study groups

RESULTS

How Were Tutorial Components Utilized?

Figure 2 compares the activity patterns of course-affiliated users with others (called "general" users here) in the two random samples combined (fall 1997 and winter 1998). General users in these groups were much more likely to view the lesson portion of the tutorial only, although 31% also completed the quiz and 16% utilized all parts of the tutorial (lesson, quiz and extras such as a Quick Guide, Links). The tendency to view all parts of the tutorials was almost the same for both groups, around 15%. Of the course-affiliated users in these samples, almost 37% skipped the lesson and went straight to the quiz. In part, this behavior may result when students are required by instructors to complete tutorials that are too elementary for their skill level. It may also be attributed to students' tendency to cut corners to save time on activities that they perceive as peripheral.

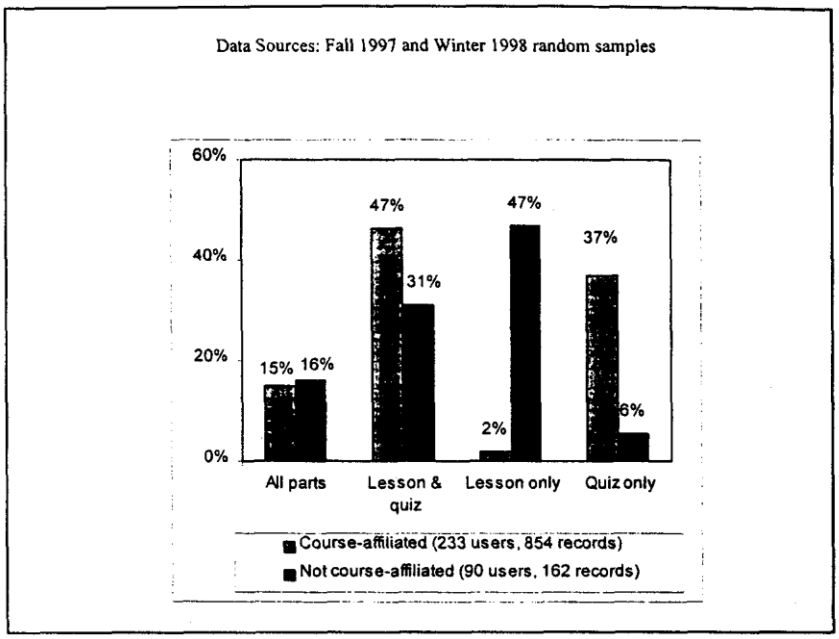


Figure 2. Use of tutorial components: General vs. course-affiliated users

Comparing behavior of course-affiliated users in a random sample to Communication 140 users during the same time period, winter 1998 (see Figure 3), provides another view. The random sample includes a more diverse array of students meeting a variety of course requirements related to *net.TUTOR.* Yet their behavior was very similar to that of Communication 140 students that quarter. These students were about as likely to bypass the tutorial's instructional content for the quiz (38% vs.40%) and to view all parts of the tutorial (10% vs. 9%).

Cornell and Martin (1997) discuss a variety of factors affecting student motivation in web-based learning environments. The manner in which quizzes are employed within tutorials can be important in motivating more careful student use of these instructional materials. In an attempt to encourage more course-affiliated users to view the instructional portion of the tutorials before taking the quizzes, changes were made in spring 1998 to the manner in which quizzes are graded. Prior to that time, quizzes were primarily intended to reinforce concepts covered in the lessons. Users were allowed unlimited attempts to answer quiz questions correctly and once a correct answer was selected, were awarded full points for their answers. Beginning in spring quarter 1998, users taking quizzes were limited to one attempt at each multiple choice quiz question. Although users are still allowed unlimited attempts to choose the correct answer, points are now deducted for any incorrect answers selected prior to choosing the correct one. The user's quiz score reflects the sum of all answers chosen.

At the same time, another version of *net.TUTOR* which mirrors the content of the original but does not require registration was created to accommodate casual users who are not completing course requirements. Because general users have shown little interest in quizzes, they were not included in the new "Basic" version of the program.

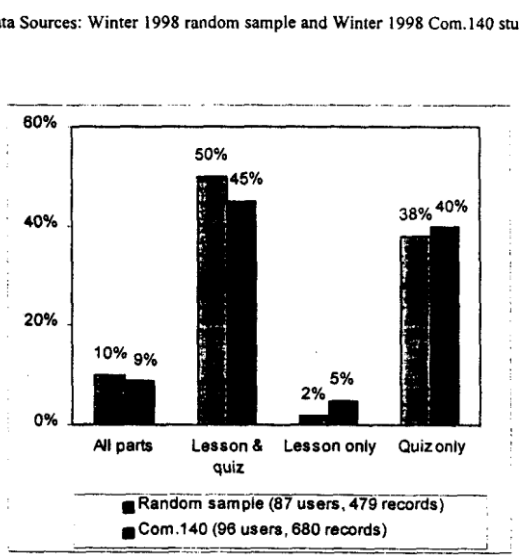


Figure 3. Use of tutorial componenets: All course-affiliated users

A comparison of study results for Communication 140 students during winter 1998 and spring 1998 is presented in Figure 4. After the program changes described here, 15% fewer students skipped lessons and more students utilized all parts of the tutorials.

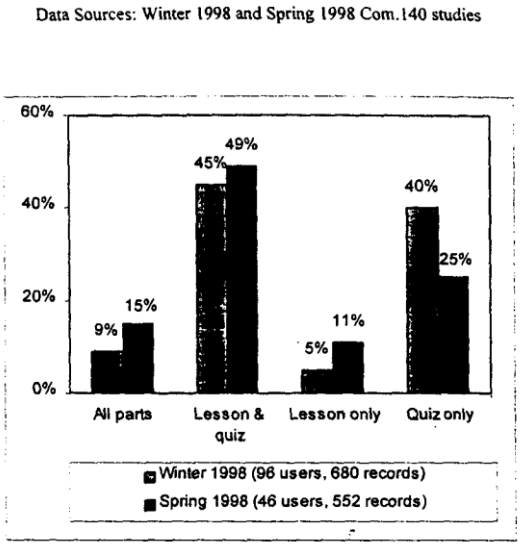


Figure 4. Use of tutorial components: Communication 140 students

How Much Time Did Users Spend on Tutorials?

Another purpose of the various studies was to learn how much time users were spending on the tutorials and to identify any differences in this regard between general and class-affiliated users. The history logs provide date and time stamps for every user action, so it was possible to calculate the total amount of time each user spent viewing lesson pages in the tutorials.

Figure 5 shows time data for course-affiliated and general users in the random samples for fall 1997 and winter 1998 combined. On average, course-affiliated users spent 12 minutes while general users spent 23 minutes (almost twice as much time) viewing content in the tutorials. Some of this difference may be attributed to users connecting via modem versus those using campus computer labs or other speedier Internet connections. General users may also be somewhat more likely to try suggested activities in the tutorials, which would lengthen the time spent viewing pages.

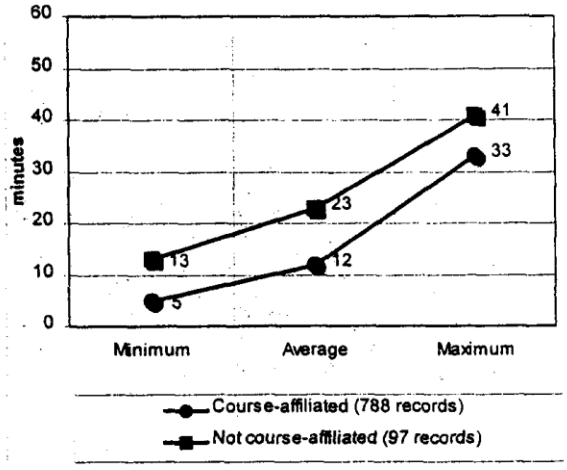


Figure 5. Lesson time: General vs. course-affiliated users

Figure 6 compares lesson time for course-affiliated users from the winter 1998 random sample to those in the Communication 140 study for that same period. Communication 140 students were spending about 16 minutes per tutorial on average, 4 minutes more than other students.

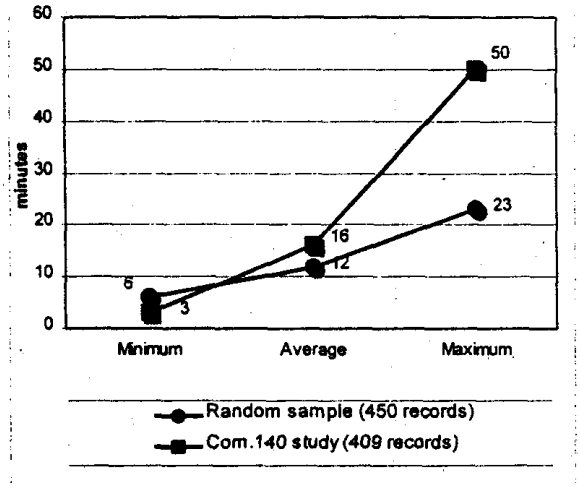


Figure 6. Lesson time: All course-affiliated users

Because of the variety of course-affiliated users in the winter 1998 random sample, further analysis of study data by type of course and by type of lesson was possible. Figure 7 divides users into three clusters, those taking introductory 100-200 level courses, those in more advanced classes at the 300 or above level, and those not affiliated with any course. Furthermore, time spent by each of these groups is shown by type of tutorial.

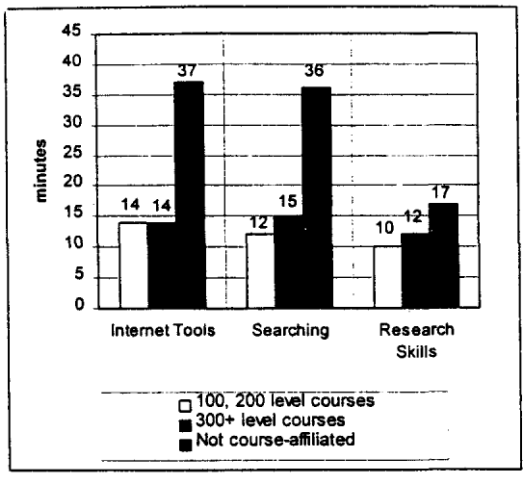


Figure 7. Average lesson time by type of lesson and user characteristics

Those in upper division or graduate courses (300+) spent slightly more time on searching and research skills related tutorials than students in lower level courses. Time spent on tutorials which introduced basic tools (browsers, email, etc.) was similar for students in both groups. General users spent more than twice as much time on tutorials related to using basic tools and searching concepts but only slightly more time than class-affiliated users on the tutorials related to research skills (research strategies, evaluating Web sites, citation methods).

Did those in upper division courses spend more time on particular tutorials, compared to those in lower division courses? Figure 8 shows time variations by specific tutorials between these two groups in the winter 1998 random sample. The advanced students spent more time on tutorials in all cases except for the searching concepts lesson, where the average time spent was equal, and the introductory browsing lesson, where the advanced students spent 44% less time than those in lower division courses. Presumably they are much more comfortable with the mechanics of Web browsing by the time they take these courses.

Summary and Discussion

Data from the studies described in this article yielded information about user behavior patterns that in rum aided further development of the *net. TUTOR* program. Indeed, this was the primary purpose for undertaking these studies. However, some of the findings and conclusions drawn may also be useful to others who are developing Web-based tutorial programs for use at the University level.

First, expect that users will move through tutorial content at a fairly rapid pace. Jacob Nielsen (1997) cites usability studies indicating that 79% of users scan web pages rather than reading word-for-word. Nielsen suggests that Web content should be designed to facilitate easy

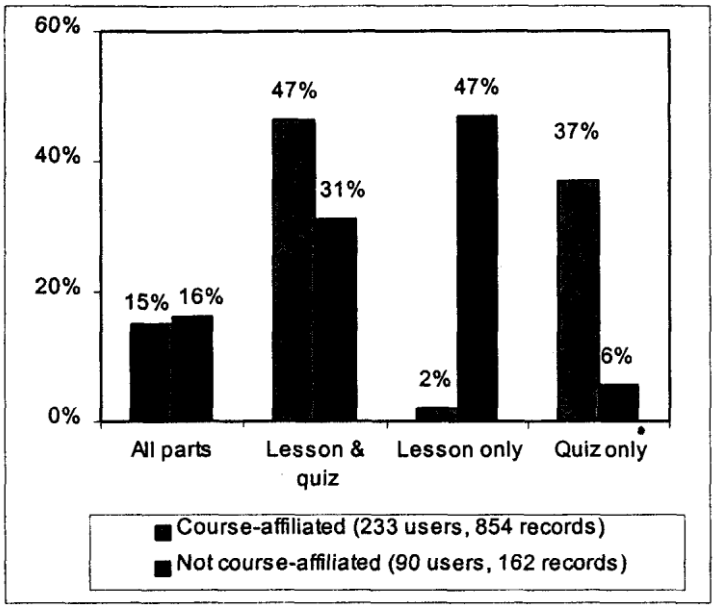


Figure 8. Time variation by tutorial: Students in upper division courses compared to others in lower division courses

scanning. Since reading from computer screens is slower than from paper, he also recommends that Web pages contain only 50% of the word count of paper equivalents in order to enhance readability

The *net.TUTOR* studies indicate that those using the program as a course requirement spent from 12 to 16 minutes per tutorial. The average length of these tutorials is 15 screens. Content is presented concisely and in most cases does not extend beyond the viewable area of the browser window. Users studied often spent less than a minute waiting for the page to download, reading instructional content on screens, and following additional links for activities or to display optional illustrations.

Second, quizzes are a valuable tool for motivating course-affiliated users to complete tutorials, but they must be structured in a manner that supports this goal. When *net.TUTOR* users were penalized for incorrect answers and guessing was discouraged, they were more likely to read lessons before taking quizzes so that quiz scores reported to instructors would be in the acceptable range. General users are much less likely to take quizzes and are more motivated to read tutorial instructional content if presented in a manner that encourages easy reading.

Finally, what is the value of adding extra features to tutorials? If you build them, will they come? A study of student use of chemistry tutorials indicated that use of additional resources was minimal (Tissue, Earp, Yip, & Anderson, 1996). The *net.TUTOR* studies show that 9 to 16% of users viewed additional features (Quick Guides, links, etc.), but there were no significant differences between behavior of course-affiliated and general users in this regard. Any investment of development time on supplementary materials should be guided by the recognition that they will be of interest to only a limited segment of users.

The supplementary materials utilized in *net.TUTOR* are exclusively text based, in accord

with design criteria mandating that tutorial components should be accessible to users with basic browsers and average bandwidth. Over time, users will have more sophisticated browsers and be more capable of using video, animations, simulations, and other interactive features without having to download and install additional software. Further study of more advanced or interactive supplementary features may find that tutorial users are more likely to utilize these types of resources.

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